

## The Microscope

Scientific discovery often depends on developments in technology

The microscope has provided scientists with a new understanding of cells and microorganisms

Why do you think scientists use microscopes?



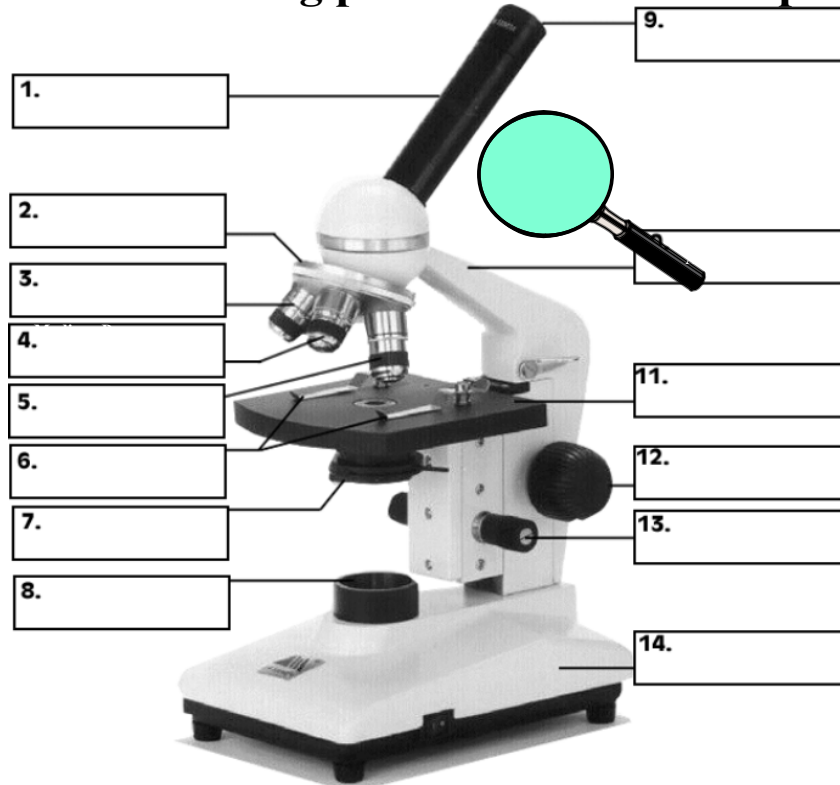
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## The Compound Light Microscope

- **provides the user with magnification based on a system of two lenses**
- 
- **limit of the light microscope is about 2000x (400x for the microscopes in the science lab)**

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## Label the following parts of the Microscope



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## Calculating Magnification

To calculate magnification in a compound light microscope you multiply the magnification power of the objective by the magnification power of the ocular.

Example:

Ocular = 10 x

Objective = 4 x

Magnification = 10 x \* 4 x  
= 40 x

Calculate the magnification values in the following situations

1) Objective = 10 x      Ocular = 10 x



2) Objective = 40 x      Ocular = 10 x



3) Objective = 100 x      Ocular = 10 x



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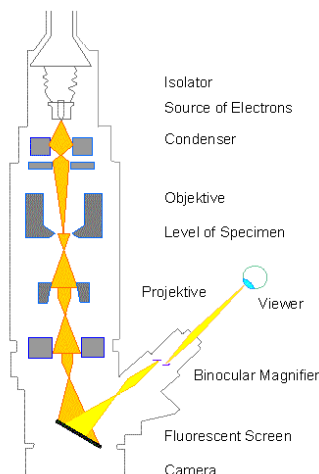
# How to correctly use a MICROSCOPE

1. Always carry the microscope using two hands; one on the base and one on the arm
2. Always store your microscope with ...
  - the stage in the lowest position
  - the lower power objective in place
  - the cord securely wrapped around the base
3. When using the microscope always start by focusing under low power and working your way up to high power. (Being sure to refocus the specimen with each objective)
4. Never slide the microscope across the bench. If you want to look at a particular specimen walk over to the microscope and look.
5. Marks will be deducted if at any point you are caught doing one of the above in an inappropriate fashion.

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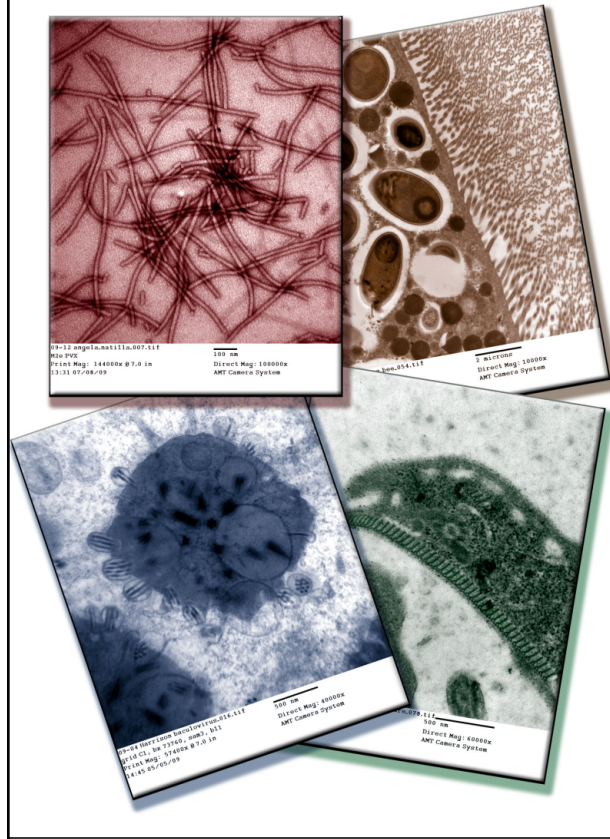
## Transmission Electron Microscope (TEM)

- Capable of magnification of 2 000 000x
- specimens being observed must be dead. (Unable to examine a living cell)
- Operates by having beams of electrons pass through a single layer of cells and reflect to create the image.
- Used to observe internal structures. ex. nucleus



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## TEM SPECIMEN IMAGES



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## SCANNING ELECTRON MICROSCOPE (SEM)

- Capable of magnification up to 100 000x
- Specimens must be dead.
- Used to observe the external structures of a specimen.  
(Electrons are reflected off the surface of the specimen being observed.)



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## SEM Specimen Image



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## QUESTIONS

1. Which microscope do you think would be best for viewing each of the following? Give a reason for your choice.
  - a) A virus
  - b) A hair mite's body
  - c) A detailed structure of a cell's nucleus
  - d) A living microorganism
2. Give one advantage of using the compound light microscope over a transmission electron microscope.

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**Complete the first two columns of the following chart in your notes on a separate piece of paper.**

<b>K</b> <b>What do you KNOW about the cell</b>	<b>W</b> <b>What do you WANT to know about the cell</b>	<b>L</b> <b>What have you LEARNT</b>

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## **The Cell**

- There are two basic types of cell

1) **Prokaryotic Cells** - cells that lack a true nucleus  
ex: Bacteria

2) **Eukaryotic Cells** - cells that have a true nucleus  
ex: Animal and Plant cells

- Animal and Plant cells share many common organelles

**Organelle** - a specialized structure suspended in the  
cytoplasm of the cell  
ex: mitochondrion, ribosomes

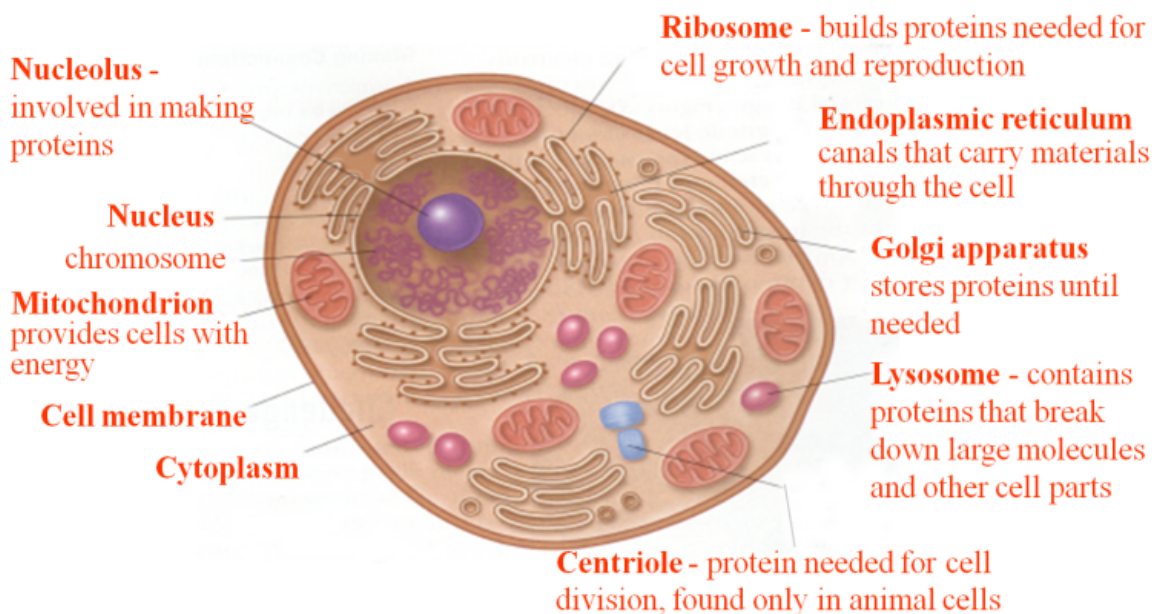
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## Similarities Between Plant and Animal Cells

- 1) All cells have a true **nucleus** that acts as the control center of the cell directing all cellular activity.
- 2) The nucleus contains **chromosomes**. Chromosomes store the organisms genetic information.
- 3) Each chromosome contains a number of genes, which contains the genetic information that determines the characteristics of the cell
- 4) All cells have a **cell membrane** that covers the entire cell. The cell membranes controls what can enter and leave the cell.
- 5) Both cells contain cytoplasm. The cytoplasm is found inside the cell and is the material in which nutrients are absorbed, transported, and processed.
  - The cytoplasm holds the cells organelles.

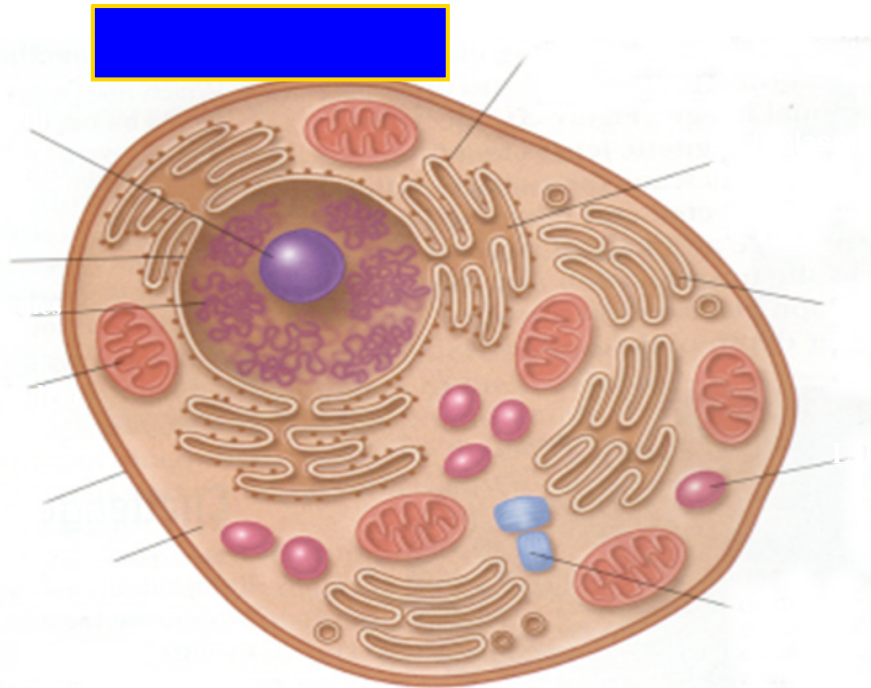
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## The Animal Cell



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## THE ANIMAL CELL



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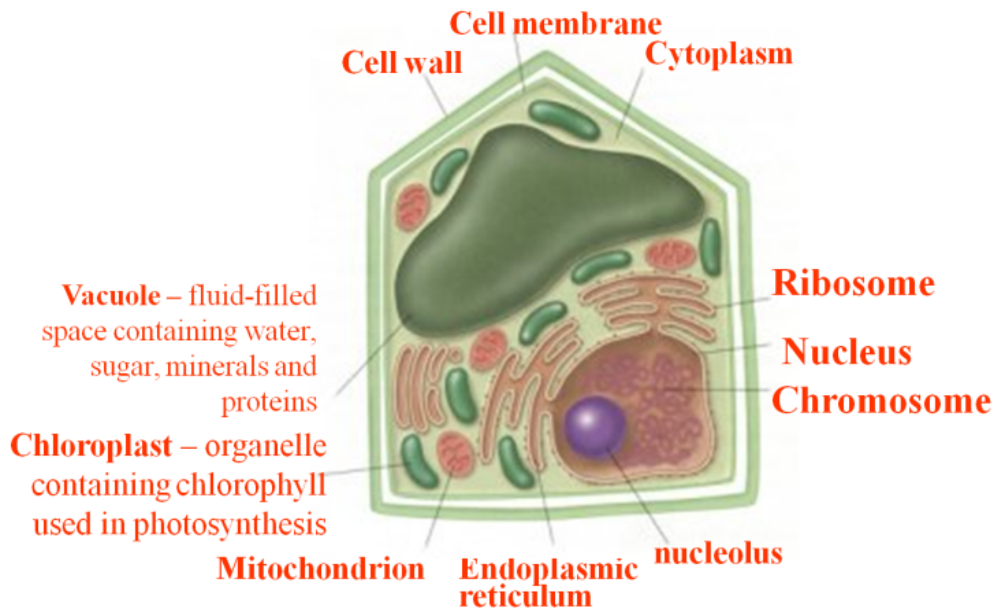
## THE PLANT CELL

- Contains all the organelles of the animal cell ( except the centrioles) plus a few other organelles such as the:
  - **Chloroplast** - involved in photosynthesis
  - **Central Vacuole** - storage place for water and minerals found inside the cell
- Plant cells also are surrounded by a **cell wall**

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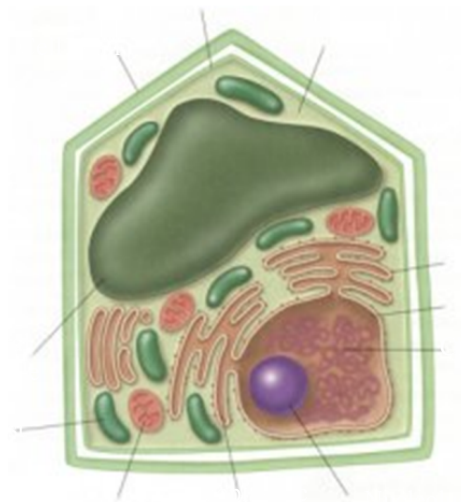


# The Plant Cell



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## THE PLANT CELL



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